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Topographical memory and the concentration of attention in top female tennis players

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Abstract

The purpose of this study consists of analyzing the existing correlations between the topographical memory, the concentration of attention under slow and fast speed conditions and the sports performance of the top junior female tennis players. The MT and TAC computerized tests, included into the PSISELTEVA battery, developed by RQ Plus, evaluates the topographical memory and the concentration of attention, expressed through specific parameters. The subjects who took part in this study are 8 junior female tennis players, taking part of the elite of the Romanian and of the European players. Using the Spearman correlation there have been important relations highlighted between the topographical memory coefficient, the concentration of attention under fast speed conditions and the sports performance, expressed through the ranking position (the official ranking system).

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1. Main text

As a mental function, attention accompanies mental activity being the one that leads to the modelling of the nervous tonus which is compulsory in developing all the other mental processes; it appears as a background condition for the developing of knowledge processes, auto-analysis and auto-evaluation processes, as well for motor actions; it consists in orientating and concentrating of the mental activity on an object or phenomenon, thus optimizing the knowledge of a sector of the surrounding reality or of the inner, subjective life – it ensures the triggering, maintaining and optimization of the cognitive processes (Horghidan, Mitrache, & Tudos, 2001). Through

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attention we realize an important selection of the stimuli. As a property of conscience, attention implies the existence of a certain degree of focalization on a region which becomes central in relation to the rest of the ensemble, which comes to occupy a marginal position. Attention appears during the state of active standby and concurs with the optimum level of performance in a given task. Through attention: an event is perceived with a higher speed; the clarity of an object or activity grows (by increasing the conscious process); a selection of certain impressions is made (while others are more fading). Researches indicate the need of a high level of attention to obtain successful performance in sport (Hsieh, Huang, & Hung, 2010). Athletes differ at staying focused on performance and avoiding distraction. Studies (Furley, Bertrams, Englert, & Delphia, 2013) are demonstrating that an athlete's capability to focus attention relies on the situational availability of self-control strength. It is also mentioned that motor memory depends on attention's concentration capacity (Grigore, 2001). Topographical memory requires retaining for a period of time a certain route and to use this information in a predetermined purpose. Such a task includes orientation in space, focusing, cognitive efficiency, risk taking, etc. The topographical memory represents a kind of knowledge stored in the form of spatial representations (Zlate, 1999), being essential for a better adaptation to the environment. This ability to temporarily retain and manipulate information concerning the visual and spatial layout of the perceived environment is an essential cognitive process in human working memory (Pearson, Ball, & Smith, 2014). Having a special importance in the psychomotor, mental organization, in organizing the external and internal space, along with the movement memory, topographical memory is decisively influenced by the level and quality of the psychomotor stimulation in childhood, by systematically practicing physical exercises specific to various types of sports. Specialized literature (Epuran, Holdevici, & Tonita, 2001) mentions the importance of spatial memory in sports based on the understanding of the complex situation, reported to the athletes own action.

2. Organization of the research

2.1. The purpose of the research

The scope of our research was to investigate the topographical memory, expressed through some related parameters (topographical memory coefficient, the time in which the participant has executed the test, performance coefficient), the attention concentration (under slow speed conditions and under fast speed conditions) and the sports performance of the top junior female tennis players.

2.2. Subjects

A number of 8 elite female tennis players have participated at the study, aged between 14 and 16 years and having a competitive experience comprised between 5 and 8 years. The female athletes are ranked in the top 10 junior players in Romania and half of them were ranked in the top 10 players in Europe under 16 years at the end of the 2013 competitional year.

2.3. Methods

To solve the research issues, we used: observation, conversation, test – MT Test and TAC Test, within PSISELTEVA tests, elaborated by RQ Plus, statistical processing methods - SPSS and data interpreting.

2.3.1. Description and development

The MT test is conceived as a labyrinth itinerary, which offers many possibilities to move through the space between 2 points placed in the extremities of the image. The test consists in giving, in a limited time, responses based on the memorized information. Image content: a labyrinth itinerary marked with yellow arrows, a starting point placed in the left upper side of the screen marked with a red circle, an arrival point situated in the bottom right part of the screen and marked with a green circle. As response devices one can notice a desk on which there are three central buttons and a side button. Concerning the dynamics of the test, for a determined duration of time, one of the

ramifications of the labyrinth itinerary appears marked by green arrows. The task of the participant is to memorize the itinerary marked with green arrows and to issue a response for its retracing, forward - backwards, from memory. The responses are given by pushing the buttons of the desk according to the established program. TAC test consists in giving a pre-established answer for each signal-stimulus identified among insignificant stimuli. When conceiving the test the creation of the following problematic situation were taken into consideration: the fast ongoing of visual stimuli in a limited visual field, the random appearance (time and space) of significant visual stimuli, the appearance of a perturbatory factor (by alternating light), a combination of significant visual stimuli with insignificant visual stimuli, changing the tempo of the action. The image contains a rectangle inside which there are seven letters (the error warning window is placed in the lower right extremity). Answering device – lever. Inside the rectangle, rows of seven black letters runs; the ongoing of the rows is made on the vertical from up to down, in a constant apparition rhythm; randomly one of the rows may contain the S or Z letter - phenomenon which represents the apparition of signal-stimuli; in an unpredictable manner the rectangle's luminosity changes. The evaluation takes place under slow speed conditions (speed 1) and fast speed conditions (speed 2). The task of the subject is to give answer when the S or Z signal-stimuli appear by pressing the left button of the lever (the preferred hand was used, being generally faster). TAC test has an exercising part, which the participant is required to complete before the begining of the slow speed conditions (speed 1). The test lasts about 10 minutes.

2.3.2. Results of the MT test (topographical memory)

The coefficients provided by the battery soft are:

- cmt (topographical memory coefficient) – it refers to the correctly issued answers and failed answers;
- performance coefficient – qualitative measure statistically calculated by reporting Cmt to the test time;
- the test time (measured in seconds, in which the participant has executed the test).

2.3.3. Results of the TAC test (concentration of attention)

Among all the coefficients provided by the battery soft, we shall present the following parameters:

- the correctly issued answers for speed 1 (under slow speed conditions);
- the correctly issued answers for speed 2 (under fast speed conditions);
- the learning ability coefficient (rapid adaptation of the attention at new perceptual conditions – is represented by the results for the exercising part of the test);
- resistance to disruptive factors (faces a problem – distraction, unpredictable appearance of signal-stimuli, the subject gives correct answers);

The results obtained by the tennis players at MT and TAC tests have been correlated to the results obtained by the athletes in competitions, results expressed through the ranking position in Romania and Europe. The participants were tested without previously practicing any exercise (being in a repaus state).

3. Results

Preliminary data analysis (box-plot chart) has emphasized that in the case of the results obtained at MT (topographical memory coefficient, performance coefficient, test time), TAC (correctly issued answers under slow and fast speed conditions, learning ability coefficient, resistance to disruptive factors) and in the case of the sports performance (expressed through the ranking position in Romania and Europe), there were no excessive values – marginal or extreme. We present for example the box-plot for the topographical memory coefficient and for the correctly issued answers under fast speed conditions (see Fig. 1).

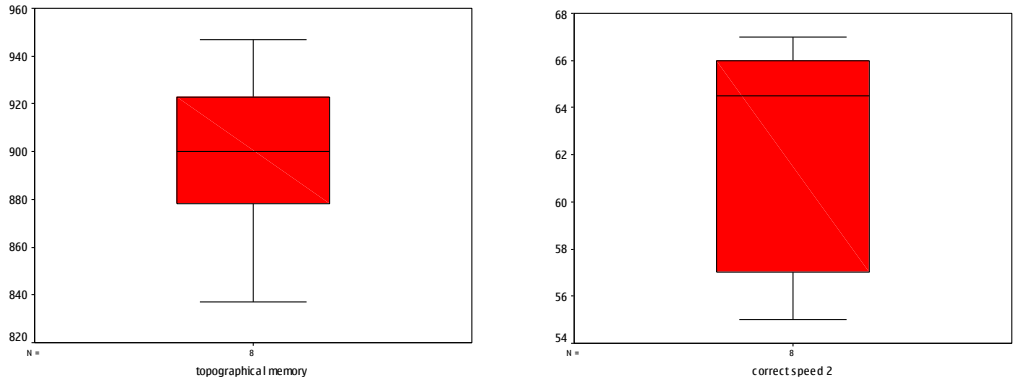

Fig. 1. (a) Extreme values – topographical memory coefficient; (b) Extreme values – correct speed 2

Using the Spearman correlation, we have verified if there were any relations between the topographical memory, the concentration of attention and the sports performance - the results obtained by the female tennis players in competitions, results expressed through the ranking position.

The following conditions for the application of the Spearman correlation are fulfilled (Labar, 2008):

- both variables are ordinal or one of them is quantitative and the other ordinal;
- the sample does not have a large volume (8 subjects);
- the scores of a variable are monotonously related to the scores of the other variable, meaning that, once the values of a variable register growth, the values of the other variable will also grow (decrease) – but not necessarily in a linear manner.

Table 1. Results for MT, TAC and for the results obtained by the tennis players, expressed through the ranking position

Variables	N	m	s	sports performance Spearman's rho Correlation Coefficient
sports performance	8	4,50	0,87	1,000
topographical memory coefficient	8	898,25	12,09	-0,740*
performance coefficient	8	33,88	1,50	0,286
MT test time	8	26,90	1,33	-0,517
correct speed 1	8	62,00	2,38	-0,444
correct speed 2	8	62,13	1,76	-0,747*
learning ability coefficient	8	87,50	3,71	-0,189
resistance to disruptive factors coefficient	8	106,48	0,91	0,378

*. Correlation is significant at the .05 level (2-tailed).

The analysis of the results indicated in table number 1 emphasizes:

- There is no correlation between the performance coefficient (qualitative measure statistically calculated by reporting the correct and failed issued answers to the test time), the test time (measured in seconds, in which the participant has executed the test) and the results obtained by the female tennis players, expressed through the ranking position ($p > 0,05$);

- There is a negatively significant correlation (-0,740) between the topographical memory coefficient (it refers to the accuracy – calculated according to the total number of correctly issued answers and the total number of failed answers) and the performance obtained by the female tennis players, expressed through their ranking position ($p < 0,05$);

As for correlation, a proper indicator for the effect size index is the determination coefficient (r^2) whose value is 0,54. We can say 54% of the variation of the two variables is common, the rest being due to other influences. It means that the relation between the topographical memory coefficient and the sports performance is strong.

- For the correctly issued answers under slow speed conditions (speed 1), the learning ability coefficient (rapid adaptation of the attention at new perceptual conditions – is represented by the results for the exercising part of the TAC test) and for the resistance to disruptive factors coefficient (the capacity to give correct answers in situations involving unpredictable appearance of signal-stimuli, distraction) we found out that there is no correlation with the sports performance ($p > 0,05$);
- There is a negatively significant correlation (-0,747) between the correctly issued answers under fast speed conditions (speed 2) and the performance obtained by the female athletes, expressed through the official ranking system ($p < 0,05$);

The determination coefficient (r^2) has a 0,55 value, meaning that the relation between the results for attention concentration under fast speed conditions and the performance of the female tennis players is strong.

4. Conclusions

This study demonstrates the existence of several significant statistic correlations between the results obtained by the female tennis players for the topographical memory coefficient, for attention concentration under fast speed conditions, and the sports performance, expressed through the ranking position (the official ranking system). There is a negatively significant correlation between the topographical memory coefficient and the performance obtained by the athletes, expressed through their ranking position. If the junior female tennis players having a competitive experience between 5 and 8 years give more correctly issued answers and less failed answers in tasks that require spatial representations, this aspect is related to a better performance of the athletes - expressed through the official ranking system. Through an adequate mental preparation completed by modeling the competition in training, the female athletes will improve their ability to recall and manipulate information about the visual and spatial properties of the environment. Also, there is a negatively significant correlation between the correctly issued answers under fast speed conditions (speed 2) and the performance obtained by the athletes, expressed through the official ranking system. If the female tennis players give more correct answers during tasks demanding concentration of attention under fast speed conditions, this aspect is associated with a better performance of the tennis players on the court. Modeling the competition in training and performing an adequate mental preparation, the female athletes will develop the ability to identify the correct answers under stress conditions expressed by increasing the dynamic of the situations. Consequently, the mentioned data may positively influence the evolution of the female players on the tennis court considering the specific situations which require orientation in space, fast and accurate reactions. Our research has been limited by the physical and mental state of the subject during testing (fatigue, affective-motivational factors) which may cause variations of the motor answers. Another limitation is constituted by the sample of athletes. The situation could be different if the sample would be constituted, for example, only of male athletes. Observation and conversation as research methods support the value of our research, which is based on the study of the topographical memory and concentration of attention. These study results provide information useful to coaches in their training strategy, for scientifically conducting the sports training. The research data will also be used by the sport psychologist, who will conceive stimulation programs for the characteristics: topographical memory coefficient (the capacity to give more correct answers and less failed answers in tasks that require spatial representations) and attention concentration under fast speed conditions, associated with sports performance. The MT test and the TAC test, may be used as complementary means of psychological preparation, may offer informations with respect to the topographical memory and the concentration of attention which may become objective points in specific training and may also represent an element of selection of the junior female tennis players for the representative team.

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References

Epuran, M., Holdevici, I., & Tonita, F. (2001). *Psihologia sportului de performanta. Teorie si practica*. Bucuresti: FEST.

Furley, P., Bertrams, A., Englert, C., & Delphia, A. (2013). Ego depletion, attentional control, and decision making in sport. *Psychology of Sport and Exercise, 14, 900–904.*

Grigore, V. (2001). *Gimnastica artistica– bazele teoretice ale antrenamentului sportive*. Bucuresti: Semne.

Horghidan, V., Mitrache, G., & Tudos, St. (2001). *Psihologie normalasi patologica*, Bucuresti: Globus.

Hsieh, T., Huang, C., & Hung, T., 2010. Relationships between heart rate variability, attention, and athletic performance. *International Journal of Sport and Exercise Psychology, 8, 473–475.*

Labar, A. V. (2008). *SPSS pentru stiintele educatiei*. Iasi: Polirom.

Pearson, D. G., Ball, K., & Smith, D. T. (2014). Oculomotor preparation as a rehearsal mechanism in spatial working memory. *Cognition*, *132, 416–428.*

Zlate, M. (1999). *Psihologia mecanismelor cognitive.* Iasi: Polirom.